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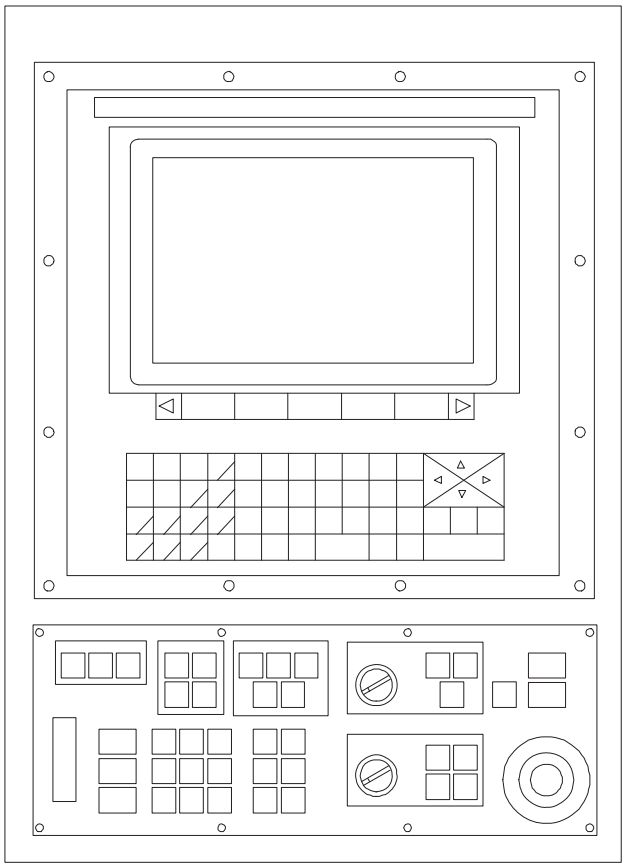
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9/Series Hardware
TAB 9

Operator Interface



852061-RM009A-EN-P – November 2000 PN-176959

Section 9A

Operator Interface

9A.0 Section Overview

This section covers the integration of the components that make up the Operator Interface for the 9/Series CNCs. A section is devoted to each of the following components:

- Operator Panel (Display device and keyboard – 3 versions)
  - Mounted Monochrome operator panel
  - Mounted Color panel (CRT and Flat panel)
  - Removable operator panel
- MTB Panel (selector switches and pushbuttons – 3 versions)
  - Standard MTB panel with fiber optic connection
  - LED type Lamp panel with fiber optic connection
  - LED type Lamp panel with Direct 24 V I/O connection
- HPG (Hand pulse generator for manual jogging)

These components work together to enable the machine tool operator to interface with the control. Data entered through the operator panel keyboard, the MTB panel push buttons and switches, and the HPG handwheel is input to the control via the system I/O ring. How the specific components connect and interact with other modules of the control is explained in the following sections.

9A.1 Operator Panel Overview

The operator can edit programs, view system data, perform machine functions, and many other tasks through the operator panel. The operator panel allows an interface to/from the control through:

- 5 softkeys and 2 page keys
- a keyboard with 51 alphanumeric, control, and shift keys
- the display (CRT or TFT)

The display terminal can be either a 9–inch monochrome CRT, a 12–inch color CRT, or the 10.4 inch color flat screen TFT. The system installer must set an AMP parameter to select between the color and monochrome displays (the removable operator panel is always a monochrome display, the flat panel is always configured as a color display). The color displays will use all white characters if the AMP parameter is set incorrectly to “monochrome”. A monochrome display will not display any RED characters if AMP is configured for a color panel. This includes ALL of the system emergency messages.

The monochrome and the color operator panels are powered by the operator panel power supply. It supplies:

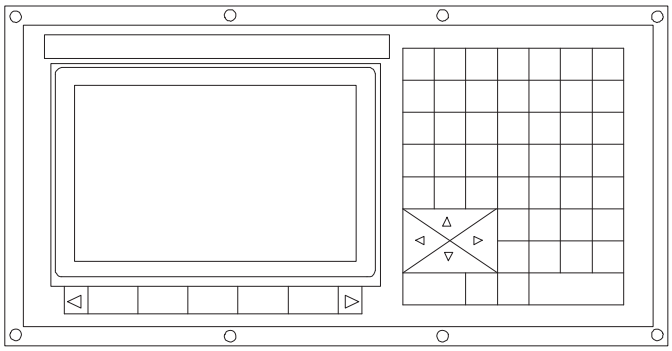
- +12V dc power to the monochrome or color flat panel displays
- +12 V dc power to the MTB panel I/O module
- +5V dc power to the keyboard I/O ring interface
- +5V dc power to the HPGs

The operator panel power supply receives power directly from the controls main power supply.

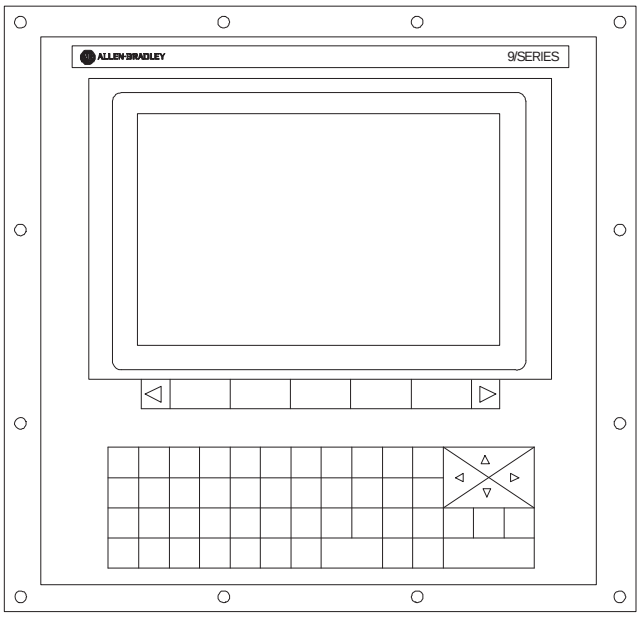
The keyboard and softkeys on the operator panel are interfaced into the 9/Series I/O ring through the keyboard I/O interface. Fiber optic cables connect the optical receiver (black) and optical transmitter (red) on the operator panel keyboard I/O ring interface to the I/O ring. For more information on fiber optic cables and connectors refer to page 7B-1.

Figure 9A.1 shows the different operator panels.

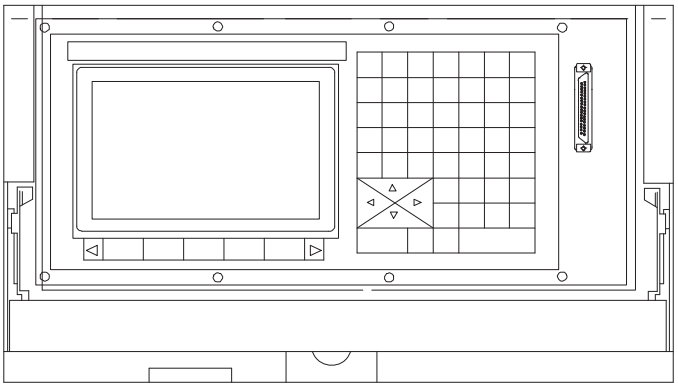
Figure 9A.1
Operator Panels



Monochrome Operator Panel



Color Operator Panels
(CRT and Flat Panel)



Removable Operator Panel

9A.2 Mounted Operator Panel Installation

The mounted operator panels are typically mounted directly in a cabinet and are fixed in their location. It is directly linked to the 9/Series fiber optic ring, and contains its own power supply. The video signal is connected directly through a cable from the main processor to the CRT.

Figure 9A.2 shows the connectors and terminal blocks of the monochrome operator panel.

Figure 9A.2
Monochrome Operator Panel Connectors and Terminal Blocks

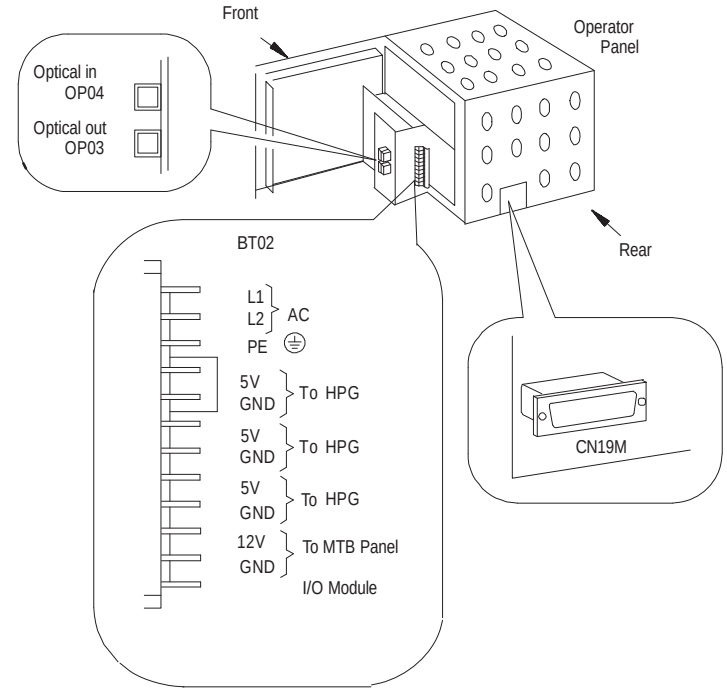


Figure 9A.3 shows the connectors and terminal blocks of the CRT color operator panel.

Figure 9A.3
Color CRT Operator Panel Connectors and Terminal Blocks

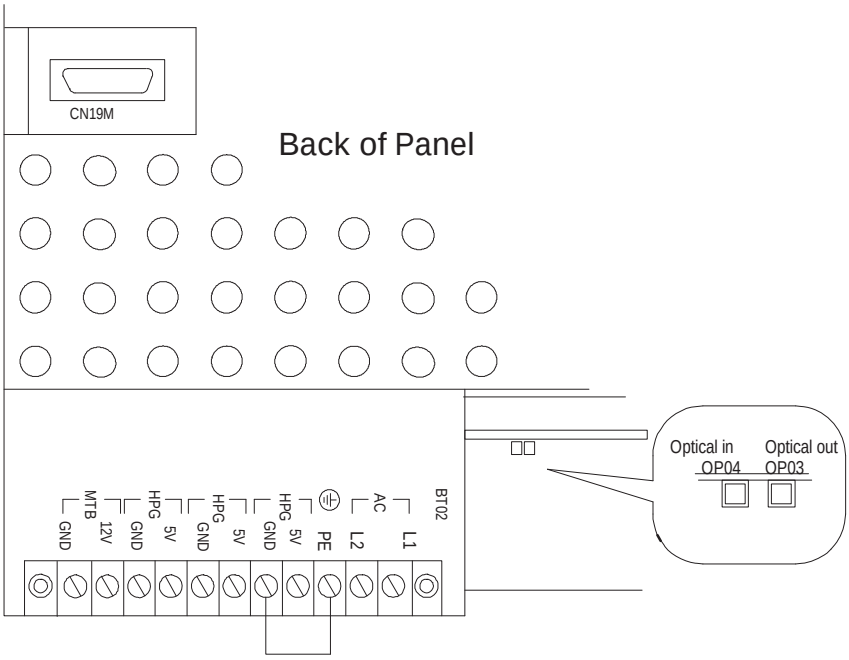
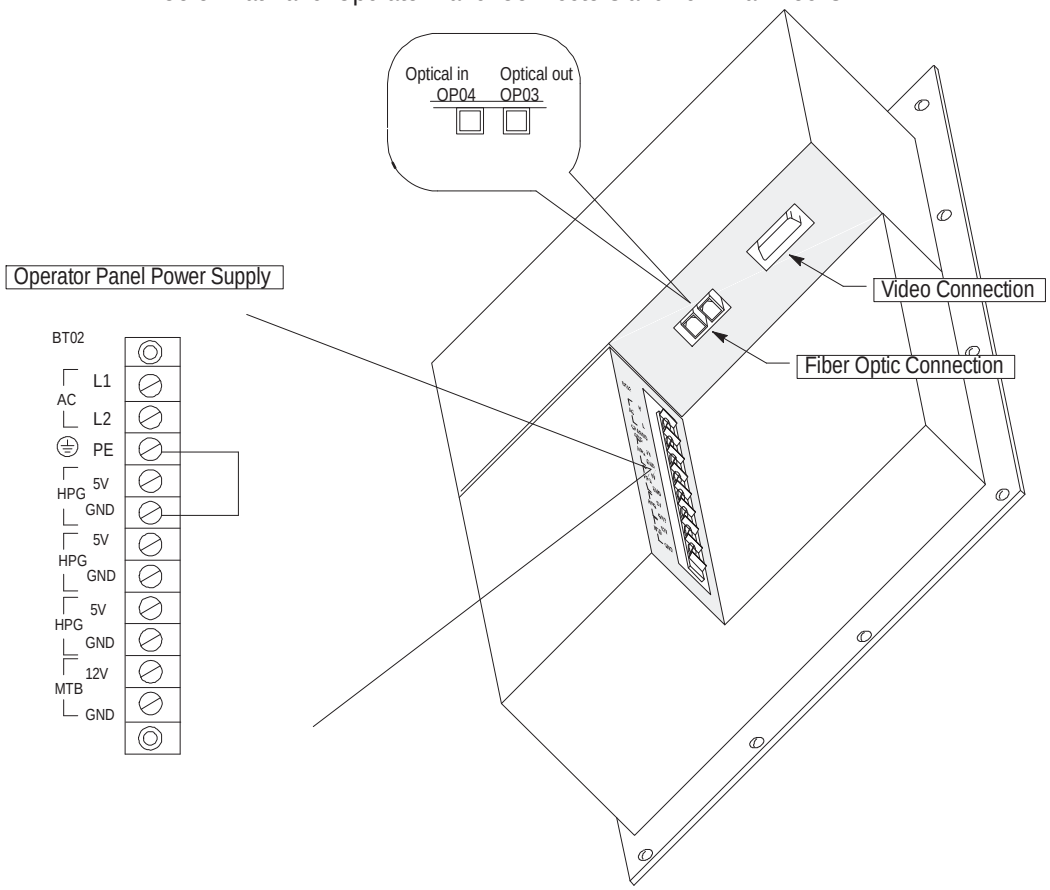


Figure 9A.4 shows the connectors and terminal blocks of the color flat panel operator panel.

Figure 9A.4
Color Flat Panel Operator Panel Connectors and Terminal Blocks



9A.2.1 Mounted Operator Panel Video Connector

Table 9A.A shows the mounted operator panel video signal connector CN19M.

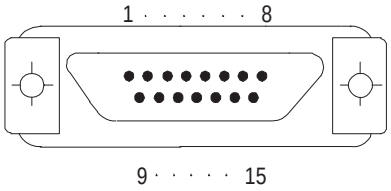
Table 9A.A
Operator Panel Video Signal Connection

Connector On Operator Panel	Connected To Component	Connector	Cable Number	Remark
CN19M	Motherboard/System Processor	Video	C09	Video Signal

Video connector CN19M is the connector that connects the video monitor with the motherboard (9/260 and 9/290) or processor board (9/230 and 9/440). Figure 9A.5 shows video connector CN19M.

Figure 9A.5 shows the pin assignments of video connector CN19M.

Figure 9A.5
Video Connector CN19M 15 Pin Male D-Shell Connector (has pins)
Pin Assignment



Pin No.	Signal Name	Pin No.	Signal Name
1	GND (SHIELD)	9	RED (L)
2	RED (H)	10	GREEN (L)
3	GREEN (H)	11	BLUE (L)
4	BLUE (H)	12	NC
5	NC	13	CLOCK (L)
6	CLOCK (H)	14	H-SYNC (L)
7	H-SYNC (H)	15	V-SYNC (L)
8	V-SYNC (H)		

9A.2.2 Mounted Operator Panel Power Supply

The monochrome, color, and color flat panel operator panels use the operator panel power supply. It supplies power to the monochrome and color flat panel displays (+12 V dc), the keyboard I/O ring interface (+5 V dc), the HPGs, and the MTB panel I/O module (note the color CRT uses 115V from the main power supply). The operator panel power supply receives power from the main power supply.

Figure 9A.6 shows the operator panel power supply.

Figure 9A.6
Operator Panel Power Supply

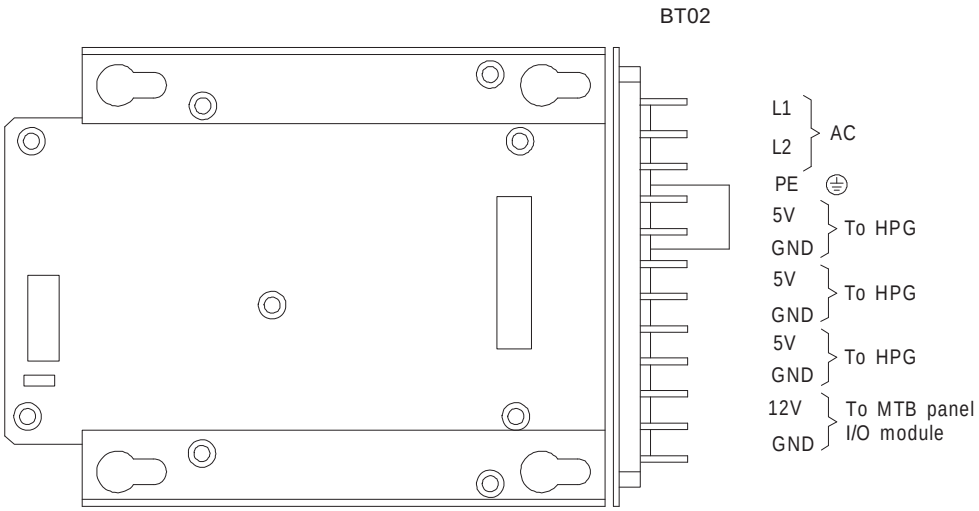


Table 9A.B shows the input and output power connections for the operator panel power supply.

Table 9A.B
Operator Panel Power Supply Connection

Connector On Operator Panel		Connected To Component	Connected To Connector		Cable Number	Remark
BT02	AC-L1 AC-L2	Main Power Supply	BT04	AUX-H AC-L	C03	AC Input
	PE	Cabinet Chassis Ground				Earth GND
	+5V dc GND +5 V dc GND +5 V dc GND	HPG (1) HPG (2) HPG (3)	BT23 BT23 BT23	+5V GND +5V GND +5V GND	C29 C29 C29	Output GND Output GND Output GND
	+12V dc GND	MTB Panel I/O Module	MTB I/O	+12V GND	C28	Output GND
CN1		Keyboard I/O Ring Interface	CN23			+5V dc
CN2		Monochrome and Flat Panel Circuit Board				+12V dc

Table 9A.C shows the output specifications of the operator panel power supply. For input specifications and fuse specifications refer to page 4D-5.

Table 9A.C
Operator Panel Power Supply Output Specifications

Item	Specifications	Remark
Outputs	5 V dc (3 terminals) 0.4 A/channel	For 3 HPGs
	12 V dc (1 terminal) 1.5 A	For MTB Panel I/O Module
	5 V dc	For Keyboard I/O Module
	12 V dc	For Monochrome and Flat Panel
Protection Function	Overcurrent protection	
Connection	Terminal Block	

Important: The color CRT operator panel has an additional internal power supply that is used to power the color CRT. The ac power supply cable, cable C03, provides ac power to the sub power supply terminal on the rear of the color operator panel as shown in Figure 9A.3. The ac power supply is jumpered internally to the color CRT power supply from operator panel power supply.

9A.2.3 Mounted Operator Panel Fiber Optic Connection

Fiber optic connection is made through the operator panel I/O interface card mounted on the back of the operator panel. Table 9A.F shows the connectors used to make the fiber optic connections to the I/O ring. Each module connected to the system I/O ring has an optical transmitter and receiver. Fiber optic cables connect transmitters to receivers to form the I/O ring. Refer to page 7B-1 for additional information on fiber optic cables and connectors. Figure 9A.2, Figure 9A.3, and Figure 9A.4 shows the location of these connectors.

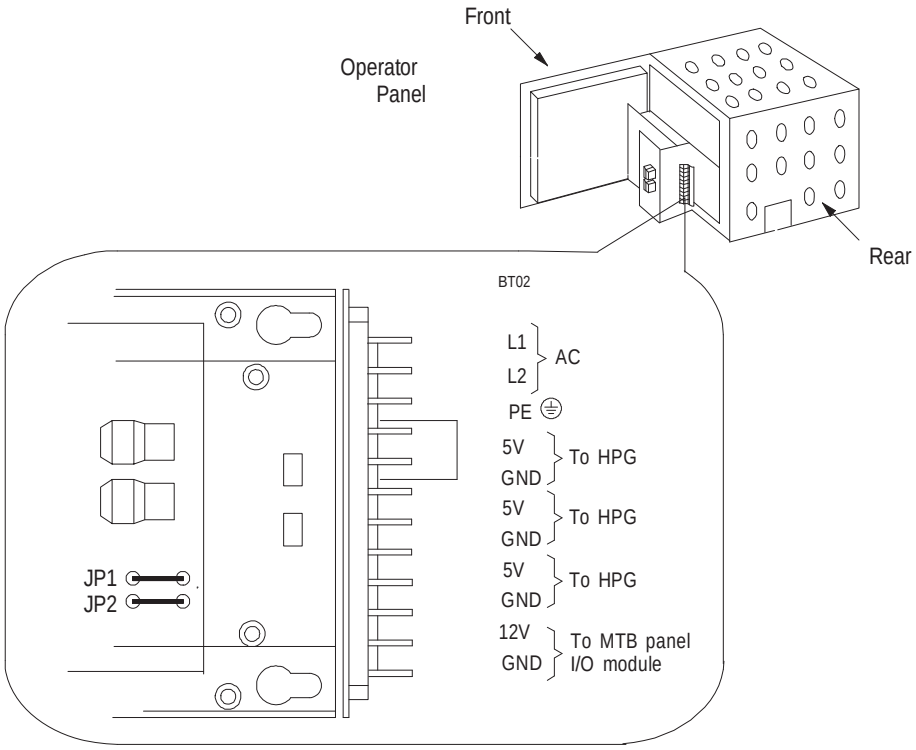
Table 9A.D
Operator Panel I/O Connectors

Connector	Connected To	Remark
RED	Receiver on next module in I/O ring	Output (OP03)
BLACK	Transmitter on previous module in I/O ring	Input (OP04)

9A.2.4 Mounted Operator Panel Node Address Setting

Each operator panel must have a unique node address on the I/O ring. The node address corresponds to a unique address assigned to each operator panel in the I/O assignment file. The node address is selected by cutting the jumpers located on the operator panel. Figure 9A.7 shows the location of the jumpers on the operator panel.

Figure 9A.7
Operator Panel Jumper Location



The preceding figure shows the jumpers located on the keyboard I/O ring interface board of the the monochrome operator panel. This board is also used by the color and color flat panel operator panels. Locate this board by the fiber optic connections.

Set the node address by cutting the wire jumper(s) according to Table 9A.E shown below.

Table 9A.E
Operator and Removable Operator Panel Node Address Setting

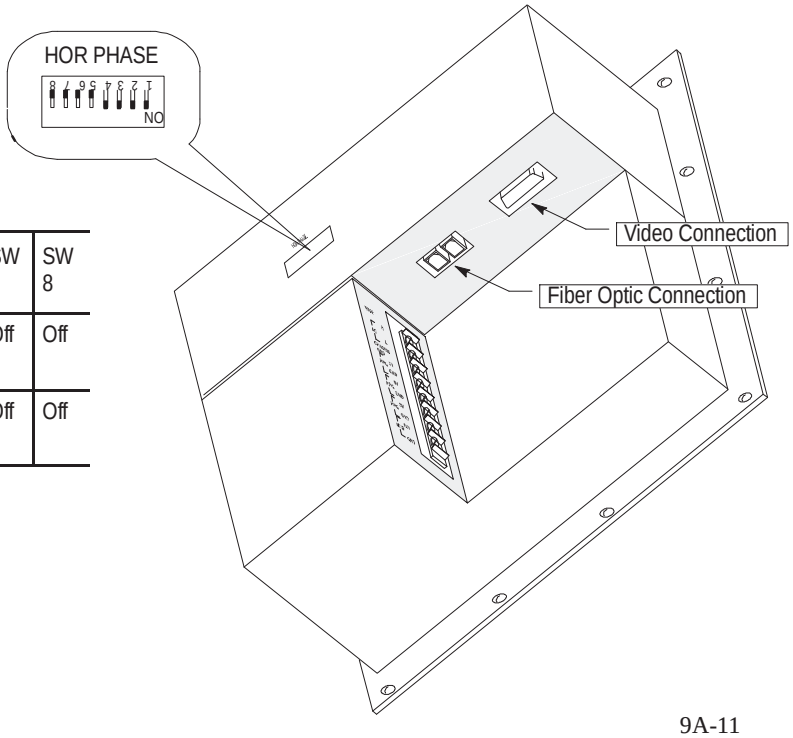
Node Address		Jumper	
Hexidecimal	Binary	JP1	JP2
00	00	Short	Short
01	01	Open	Short
02	10	Short	Open
03	11	Open	Open

The node address may be any number between 00 and 03. You may have a total of 4 interface assemblies on the I/O ring (if the removable operator panel interface is used a separate power supply is required if you use more than 2 assemblies). The same node address can be used for different types of modules, but may not be used more than once for a specific type of module.

9A.2.5 Flat Panel Horizontal Adjustment

The flat screen operator panel has a set of dip switches used to adjust the screens horizontal centering. Screen centering on the flat panel must be adjusted for different connecting control types. Figure 9A.8 illustrates the location and use of these dip switches.

Figure 9A.8
Flat Operator Panel Horizontal Adjustment Dip Switches



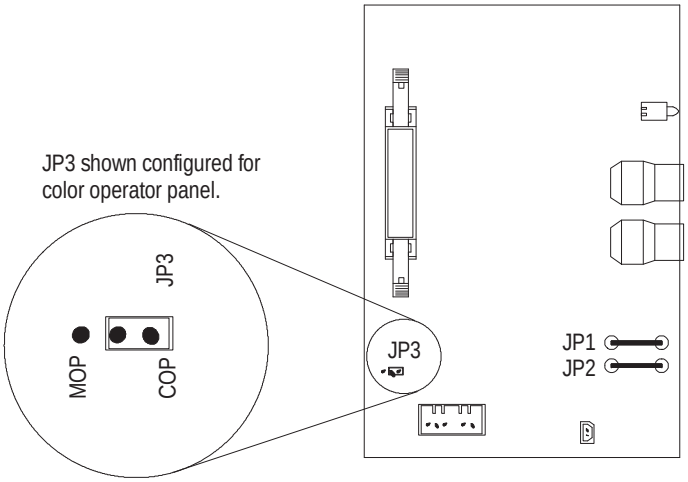
For this control type:	Sw 1	Sw 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
9/230, 9/260, and 9/290 CNCs	On	Off	On	Off	Off	Off	Off	Off
9/440 CNCs (factory default)	On	On	On	On	Off	Off	Off	Off

9A.2.6 Keyboard Interface Jumper JP3

Jumper JP3 on the operator panel keyboard interface is used to determine if the keyboard interface module is attached to a monochrome or color operator panel (note these keyboard configurations are different). This jumper comes preset from the factory in the correct position for your operator panel. Adjustment of this jumper should only be made when replacing the operator panel keyboard interface module.

Set the color or monochrome operator panel jumper (JP3) to match the type of operator panel you have. The following table illustrates proper setting of JP3.

Jumper JP3 Setting	For this Operator Panel:
MOP ●  COP JP3	Color and Flat Panel Operator Panels
MOP  ● COP JP3	Monochrome Operator Panel



9A.2.7 Adjusting Monitor Intensity

Monitor intensity is controlled by adjusting the contrast on monochrome and color CRT systems. No intensity adjustments are available for the flat operator panels.

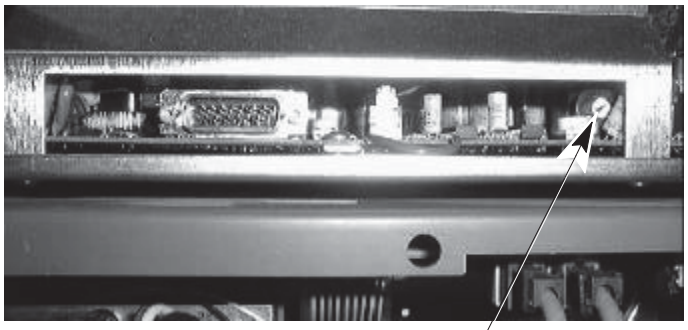
Monitor intensity adjustment is typically not required on the operator panels as they are adjusted to an acceptable level before shipping from the factory. In the event that you think you must alter the monitor intensity use the following procedure:

1. Remove power from the operator panel.

2. Remove the plastic cover from the back of the operator panel. The cover is attached with three plastic snap pins at the bottom of the cover. Pull these pins until they snap free of the operator panel.

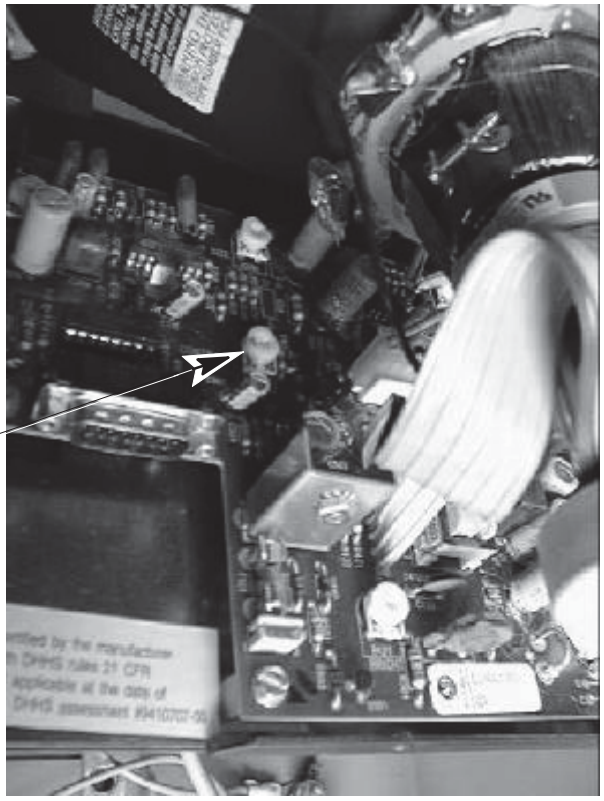
3. Using a small screw driver, adjust the contrast or sub contrast pot as shown below. Note these pots are labeled on the printed circuit board:

Color CRTs



Use Sub-Contrast Pot found at far right of video connector (Color CRT only)

Monochrome CRTs



Use Contrast Pot found behind video connector (Monochrome CRT only)

Important: We do not recommend adjusting any of the "Brightness" pots located on either CRT types. The brightness controls are preset at the factory for optimum monitor performance and reliability.

4. Re-attach the plastic cover to the back of the operator panel.

5. Re-establish power to the operator panel.

6. Repeat steps 1 thru 5 until the desired monitor intensity is reached.

9A.3 Removable Operator Panel Installation

Use the removable operator panel on controls installed in locations where operator/machine interface is not needed often and it is practical for one operator panel to be transported from control to control when necessary. The 9/Series removable operator panel allows the connection and disconnection of the operator panel from the control while the control is running. This connection/disconnection takes place without any interruption to control operation and requires no reconfiguration of the control.

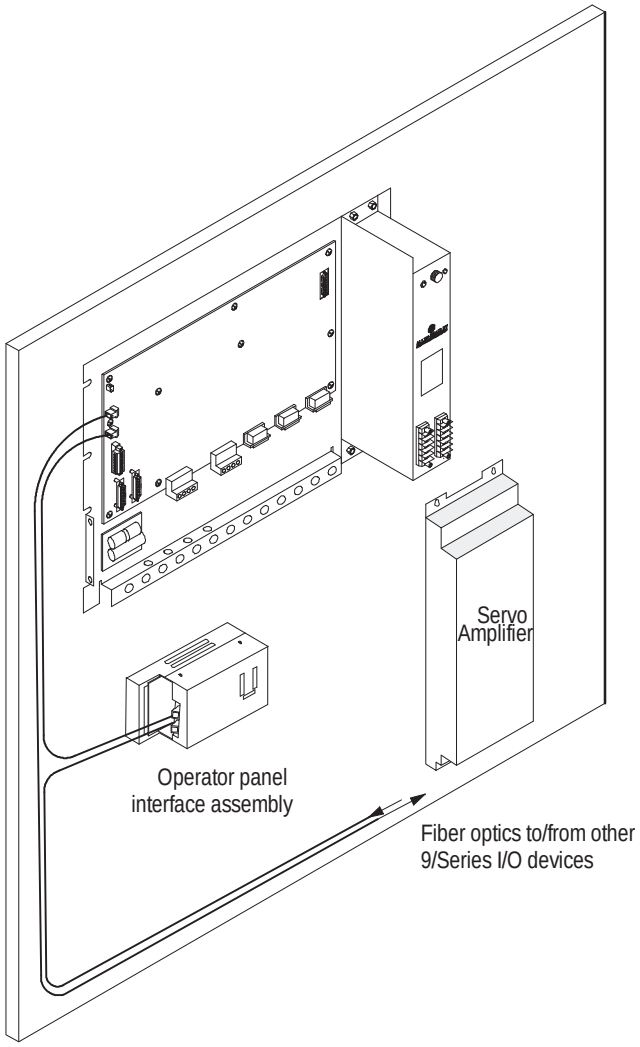
This functionality is made available through the installation of a separate operator panel interface assembly installed in the 9/Series I/O ring. This interface assembly allows the removable operator panel to be attached or detached from the 9/Series I/O ring without physically breaking the I/O ring. You must install an interface assembly in the 9/Series I/O ring wherever you intend to attach a removable operator panel.

All connections between the 9/Series controller and the removable operator panel are made through a single cable. This cable provides all necessary communications to the 9/Series control (I/O ring interface for the keyboard, video signal, and power).

9A.3.1 Installing the Removable Operator Panel Interface Assembly

The operator panel interface assembly is used to makes all connections between the 9/Series control and the removable operator panel. Install an interface assembly in the 9/Series fiber optic I/O ring at any location you intend to connect a removable operator panel.

Figure 9A.9
Placing Operator Panel Interface Assemblies

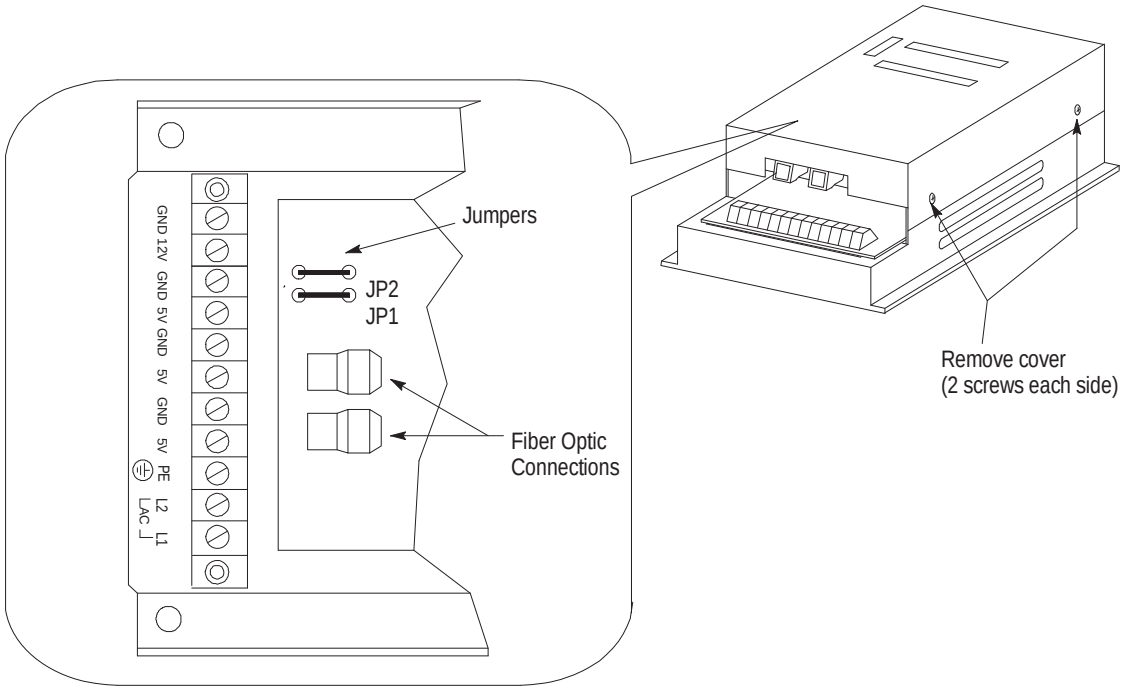


Assigning a Module Address

Each interface assembly must have a unique node address on the I/O ring. The node address corresponds to a unique address assigned as independent operator panels in the I/O assignment file found in ODS (see your PAL reference manual). The node address is selected by cutting the jumpers located on the interface assembly(s). Figure 9A.10 shows the location of the jumpers on the interface module.

Important: You must remove the cover from the removable operator panel interface assembly to access the node address jumpers. Turn off power to the interface assembly before removing the cover. Make sure to follow proper ESD grounding procedures when working on any 9/Series equipment.

Figure 9A.10
Removable Operator Panel Interface Assembly JP1 and JP2 Jumper Locations



Set the node address by cutting the wire jumper(s) according to Table 9A.E.

The node address may be any number between 00 and 03. You may have a total of 4 interface assemblies in the 9/Series fiber optic I/O ring. The same node address can be used for other types of modules however, each removable operator panel interface assembly must have its own unique address.

Reinstall the cover on the interface assembly when you have finished setting your address jumpers.

Connecting the Interface Assembly to the Fiber Optic Ring

Fiber optic connection to the keyboard on the removable front panel is made through the interface assembly. Table 9A.F shows the connectors used to make the fiber optic connections to the I/O ring. Each interface assembly connected to the system I/O ring has an optical transmitter and receiver. Fiber optic cables connect transmitters to receivers to form the I/O ring. Refer to page 7B-1 for additional information on fiber optic cables and connectors.

Figure 9A.11
Removable Operator Panel Interface Module Fiber Optic Connections

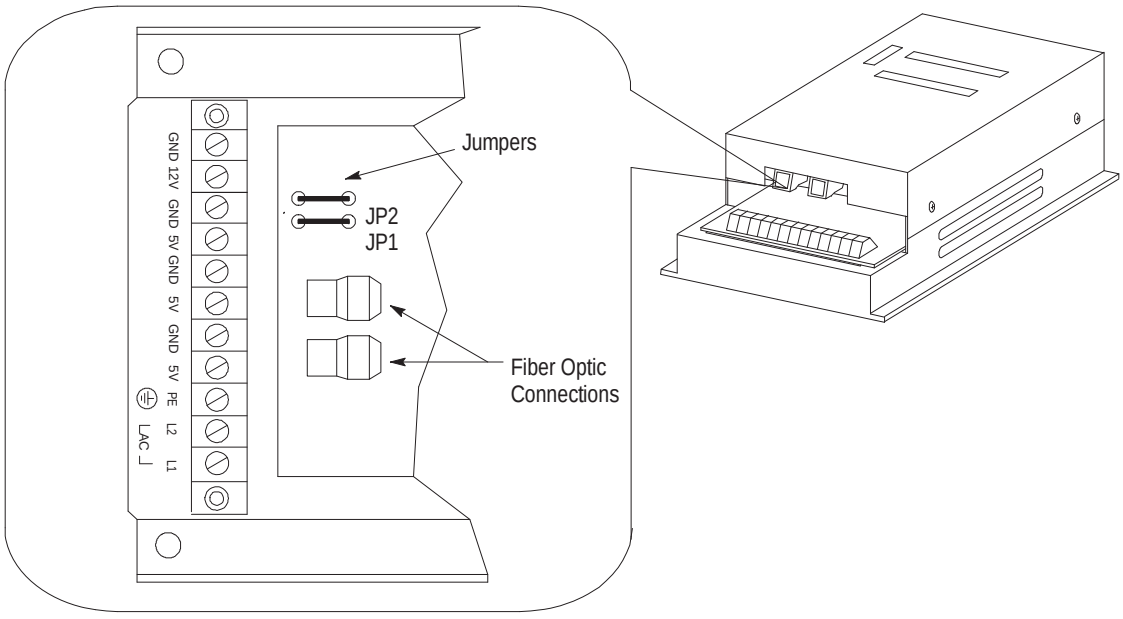


Table 9A.F
Operator Panel I/O Connectors

Connector	Connected To	Remark
RED	Receiver on next module in I/O ring	Output
BLACK	Transmitter on previous module in I/O ring	Input

You must connect both the input and output connectors of all devices on the I/O ring. You can not leave an open connector on any module.

Interface Assembly Video Connection CN19M

Table 9A.G shows the interface assembly video signal connector.

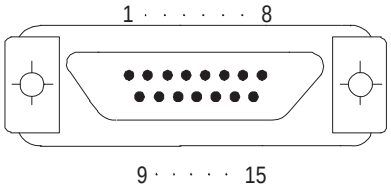
Table 9A.G
Interface Assembly Video Signal Connection

Connector On Motherboard/System Processor	To Connector On Removable Front Panel Interface Assembly	Cable Number (page 7A-24)	Remark
J8 15 pin D-shell	CN19M 15 pin D-shell	C09	Video Signal

Video connector CN19M is the connector that connects the removable operator panel interface module to the motherboard (9/260 and 9/290) or processor board (9/230).

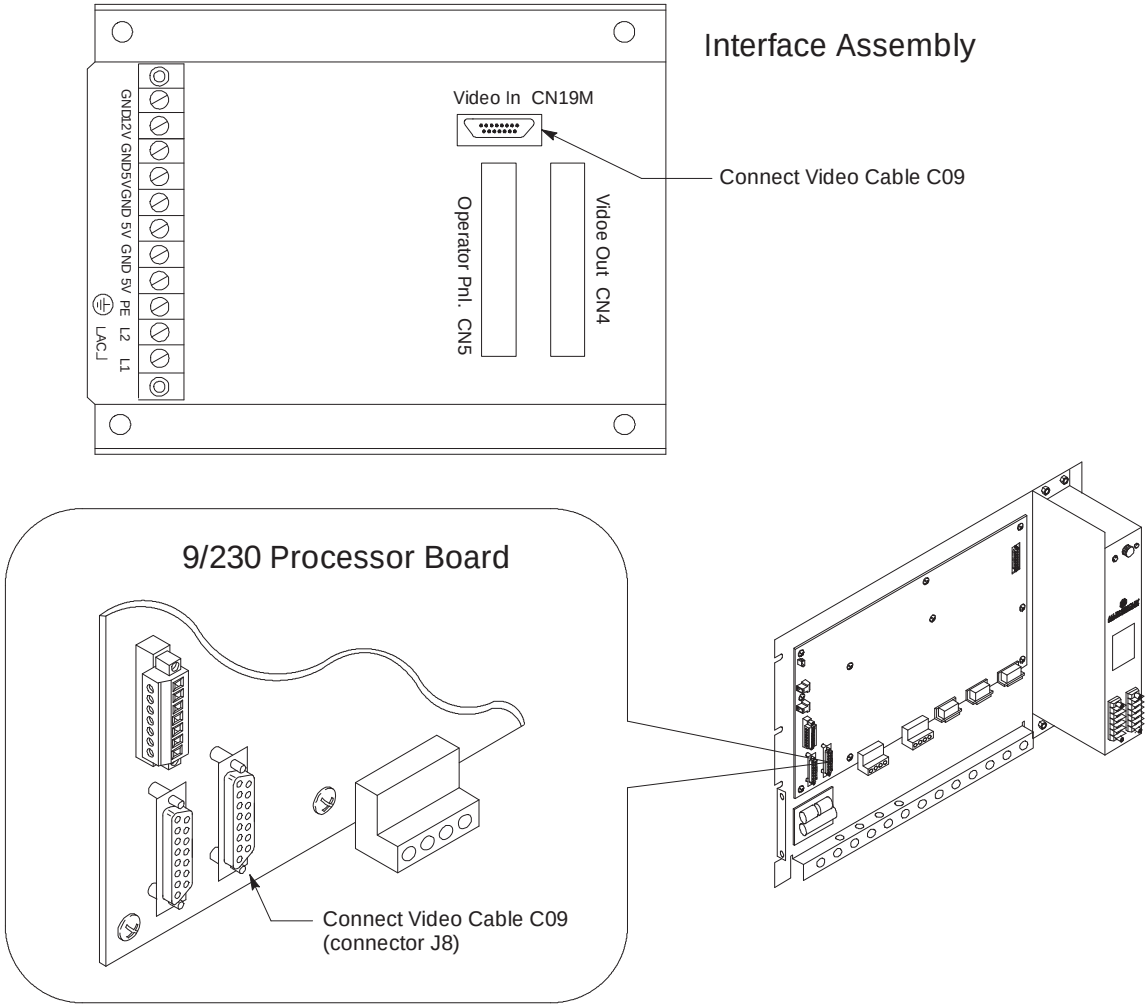
Figure 9A.12 shows the pin assignments of the video connector CN19M.

Figure 9A.12
Video Connector CN19M 15 Pin Male D-shell Connector and Pin Assignment



Pin No.	Signal Name	Pin No.	Signal Name
1	GND (SHIELD)	9	NC
2	NC	10	GREEN (L)
3	GREEN (H)	11	NC
4	NC	12	NC
5	NC	13	NC
6	NC	14	H-SYNC (L)
7	H-SYNC (H)	15	V-SYNC (L)
8	V-SYNC (H)		

Figure 9A.13
Removable Operator Panel Interface Module Video Connections



Removable Operator Panel Interface Assembly Power Supply

Power for the removable operator panel is provided by the interface assembly power supply. The interface assembly also supplies power for HPGs and an MTB panel I/O module. The interface assembly power supply receives power from the main power supply. Connect the ac-H and ac-L terminals on the BT02 terminal strip to the main 9/230 control power supply connector BT04 terminals AUX–H and AUX–L.

Figure 9A.6 shows the removable operator panel interface assembly power supply.

Figure 9A.14
Operator Panel Power Supply

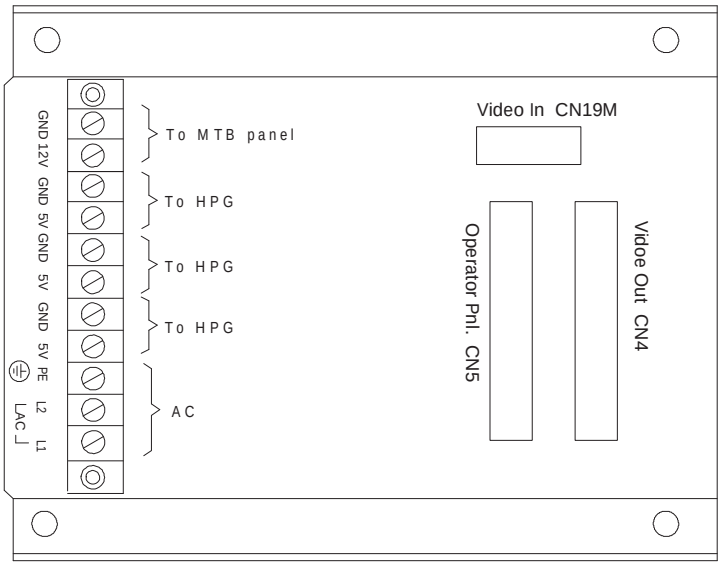


Table 9A.H shows the input and output power connections for the interface assembly power supply.

Table 9A.H
Interface Assembly Power Supply Connection

Connector On Interface Assembly		Connected To Component	Connector		Cable Number	Remark
BT02	ac-L1 ac-L2	Main Power Supply	BT04	Aux-H Aux-L	C03	AC Input
	PE	Cabinet Chassis Ground				Earth GND
	+5V dc	HPG (1)	BT23	+5V	C29	Output
	GND			GND		GND
	+5 V dc	HPG (2)	BT23	+5V	C29	Output
	GND			GND		GND
	+5 V dc	HPG (3)	BT23	+5V	C29	Output
	GND			GND		GND
	+12V dc GND	MTB Panel I/O Module	MTB I/O	+12V GND	C28	Output GND

Table 9A.I shows the output specifications of the removable operator panel interface power supply. For input specifications and fuse specifications refer to page 4D-5.

Table 9A.I
Interface Assembly Power Supply Output Specifications

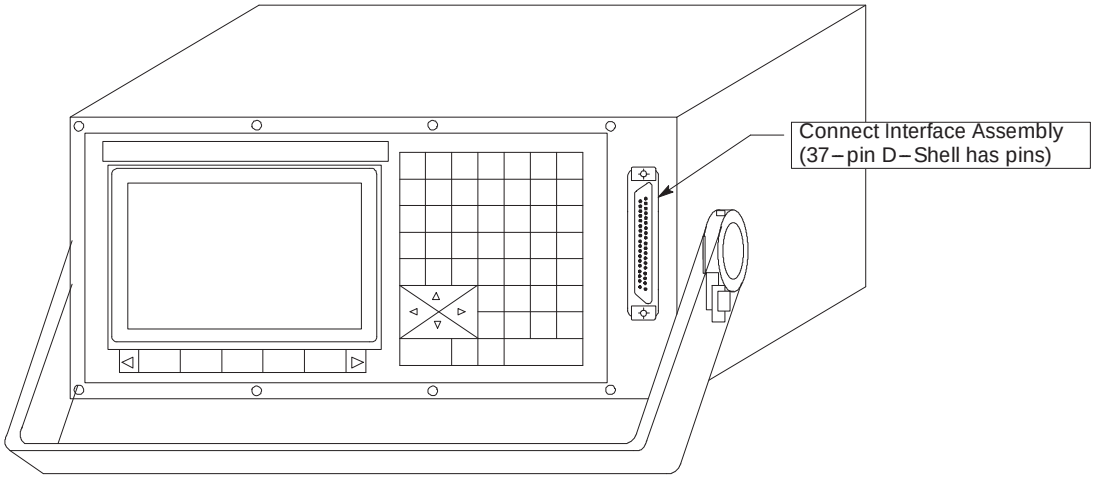
Item	Specifications	Remark
Outputs	5 V dc (3 terminals) 0.4 A/channel	For HPGs
	12 V dc (1 terminal) 1.5 A	For MTB Panel I/O Module
	5 V dc	For Keyboard I/O Module
	12 V dc	For Monochrome CRT
Protection Function	Overcurrent protection	
Connection	Terminal Block	

9A.3.2 Connecting/Disconnecting the Removable Operator Panel

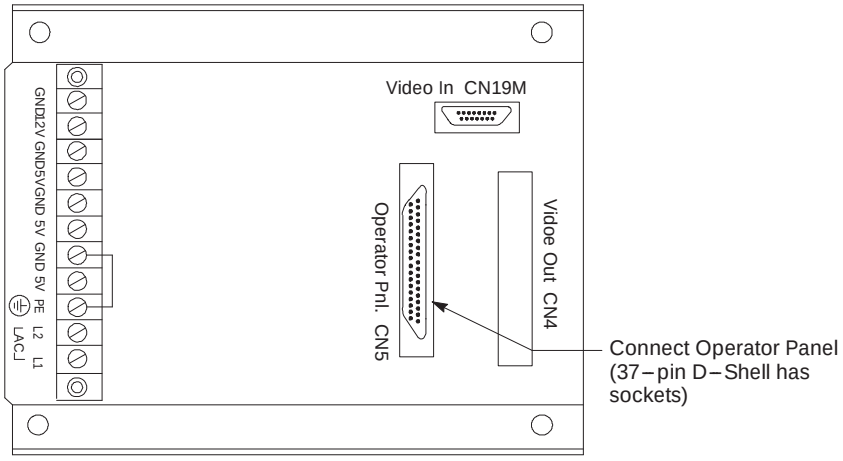
Your removable operator panel connects to the 9/Series control through the removable operator panel interface assembly you installed as discussed on page 9A-15. The connection between removable operator panel and interface assembly is made via a 10 ft (max length) cable. This cable is provided with your removable operator panel.

Attach the removable operator panel cable between the interface assembly connector CN5 and the 37–pin D–shell connector on the front of your removable operator panel. You can attach or detach the operator panel at any time. We do not recommend, however, disconnecting this panel while in the middle of editing online or Patch AMP or while editing a part program.

Removable Operator Panel



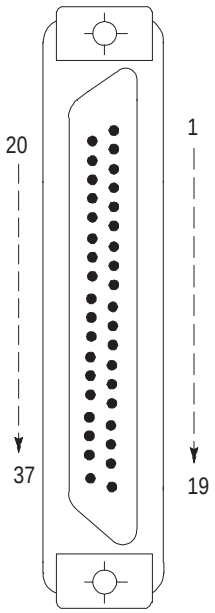
Interface Assembly



Removable Operator Panel Interface Cable

The removable operator panel interface assembly cable has a 37 pin D shell connector at both ends of the cable. The female end of the cable (has sockets) connects to the removable operator panel. The male end of the cable (has pins) connects to the removable operator panel interface assembly. The pin out connections for this cable are as follows:

Pin number:	Description:	Pin number:	Description:
1	Shld. Chassis Ground	20	Ground
2	Keyboard Data	21	Video Hi
3	Keyboard Data	22	Video Lo
4	Keyboard Data	23	H - Sync Hi
5	Keyboard Data	24	H - Sync Lo
6	Keyboard Data	25	V - Sync Hi
7	Keyboard Data	26	V - Sync Lo
8	Keyboard Data	27	Ground
9	Keyboard Data	28	12 Vdc
10	Keyboard Data	29	12 Vdc
11	Keyboard Data	30	12 Vdc
12	Keyboard Data	31	12 Vdc
13	Keyboard Data	32	12 Vdc
14	Keyboard Data	33	Ground
15	Keyboard Data	34	Ground
16	Keyboard Data	35	Ground
17	Keyboard Data	36	No Connection
18	Keyboard Data	37	No Connection
19	Keyboard Data		



9A.3.3 Multiple Removable Operator Panel Assemblies

If your machine layout calls for more than one location to plug in your removable operator panel, read this section. Multiple operator panel locations typically require a separate removable operator panel interface assembly at each location. A maximum of four interface modules can exist in the 9/Series fiber optic I/O ring.

The interface assembly provides power to the CRT as well as a keyboard interface to the fiber optic ring.

Important: It is possible to place a mounted fixed location operator panel on the ring with a removable operator interface assembly at some other location. Call your Allen Bradley support group for details on installing this type of system.

For systems with two removable operator panel interface assemblies:

- Wire the power supplies for both interface assemblies
- Connect the KBI interface to the fiber optic ring for both assemblies

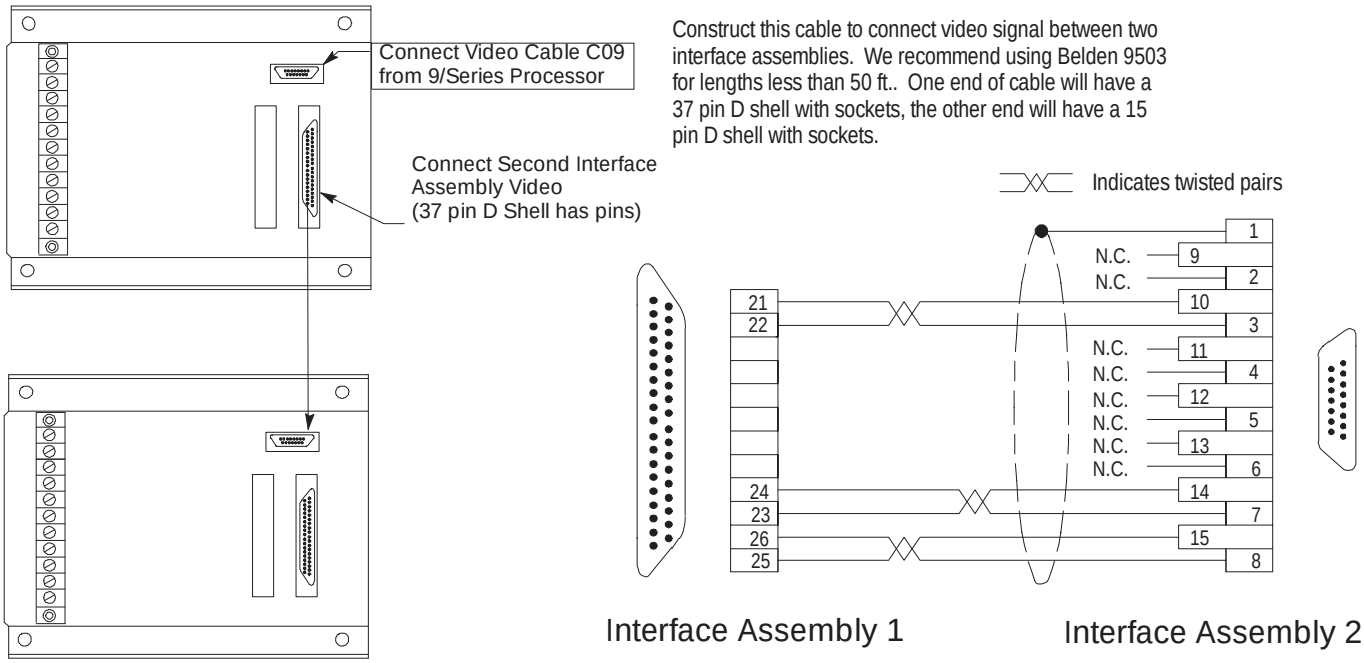
- Connect the video signal cable to only one interface assembly. Construct the cable shown in Figure 9A.15 to jumper the video signal to the second interface assembly.

ATTENTION: Use PAL to select which keyboard is the active keyboard ($KYB_SEL) in conjunction with some external device hardware. PAL should allow an operator to connect his keyboard, and lock out other keyboards from access to the I/O ring. Other keyboards can than be connected to the ring for monitoring but their keyboard inputs will be ignored. Failing to do this check will allow the connection of more than one functioning operator panel at one time which, in some applications, can be dangerous to equipment or personnel.

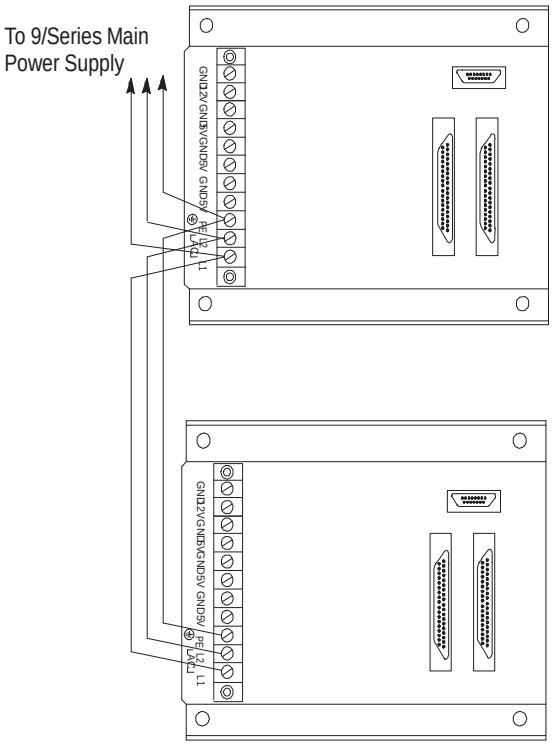
Use the following procedure to connect multiple removable operator panel interface assemblies.

1. Connect the video signal to both interface assemblies. This is accomplished by connecting the video signal from the processor to one interface assembly and jumping the video signal out of CN4 on the interface assembly to the video connection on the second interface assembly. The total video signal cable length must be less than 100 feet (including from processor to interface assembly, between interface assemblies, and to portable operator panel).

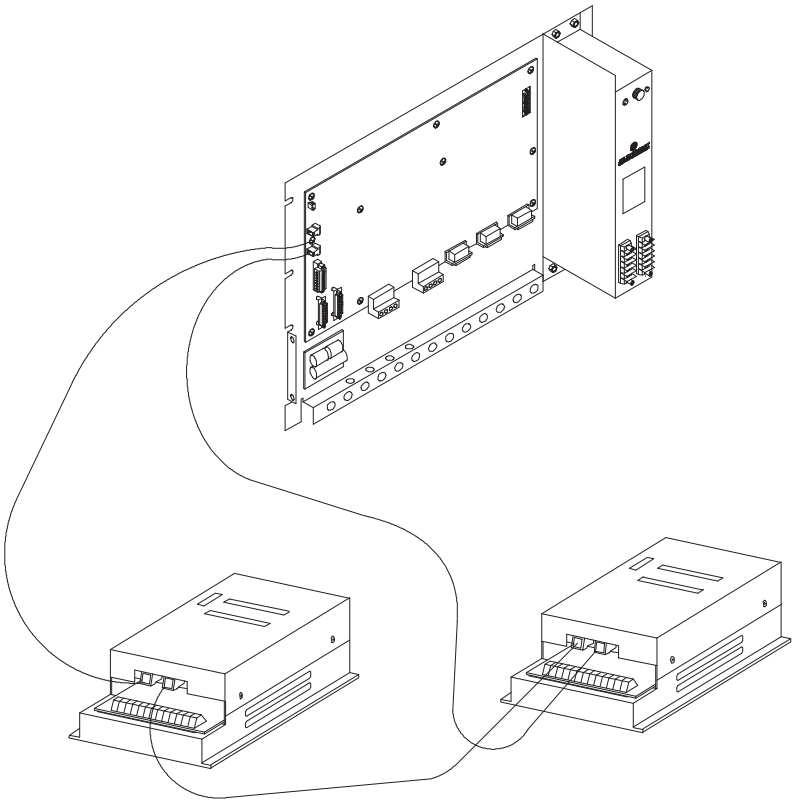
Figure 9A.15
Connecting Multiple Removable Operator Panel Interface Assemblies



2. Connect AC power from the main power supply to the interface assemblies. Daisy chain the power between the two assemblies. The standard 9/Series power supply can supply power for two interface assemblies. If your system requires more than two interface assemblies in the same ring you must supply your own external power to the interface assemblies. All interface assemblies in the I/O ring must be powered when the system is running.



3. Connect the 9/Series Fiber optic ring. Other devices can be in the ring at any location but are not shown here for clarity.



9A.4 MTB Panels

There are three versions of the Pushbutton MTB panel available for use with the 9/Series controls.

- Standard MTB panel – fiber optic (MTB2)
- MTB Panel with LED Lamps – fiber optic (MTBL)
- MTB with LED lamps– direct inputs /outputs (MTB24)

The first two of these panels are identical except for the type of illumination in the push buttons. They both are a combination of machine tool builders (MTB) pushbutton panel and a fiber optic I/O module. This combination provides the push-button MTB panel with direct fiber optic communication to the control.

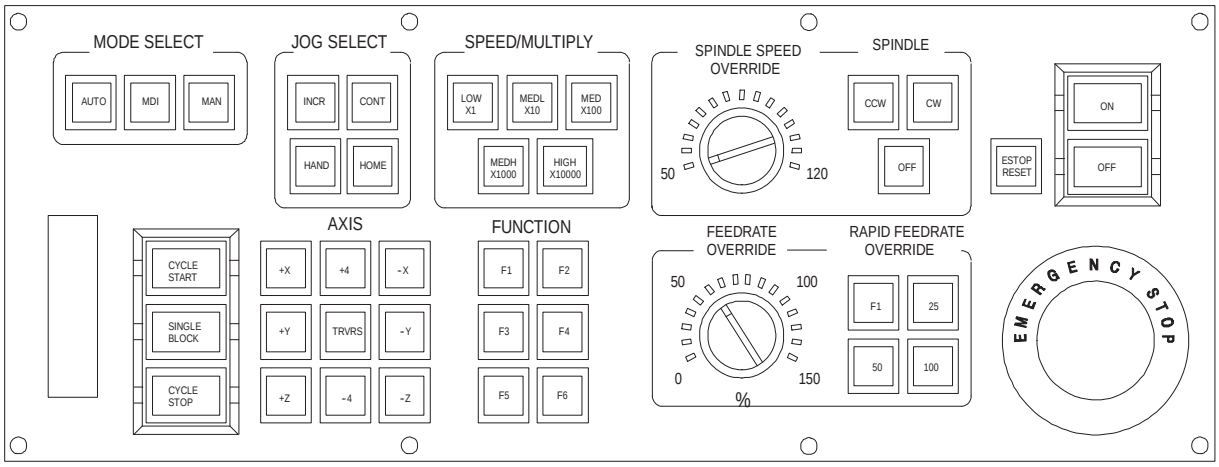
The third type of MTB panel does not have the fiber optic interface module, but provides connection from the panel using direct 24 V DC inputs and outputs. An external Fiber Optic interface device is required to provide an interface to the control. This panel uses LEDs for the Pushbutton lamps. This version of the MTB panel is used where complex switching of the signals between several CNCs is required.

The push-button MTB panels are used to provide the user with manual control over various system functions. These system functions are selected using the various switches and push buttons on the push-button MTB panel. The selected functions are then interfaced to the control via a fiber optic I/O module.

Important: A PAL module that provides the PAL logic necessary to decode the push-button MTB panel functions is available on Motion Control Bulletin Board. Refer to the 9/Series CNC PAL Reference Manual, publication 8520-4.3, for more information.

Figure 9A.16 shows a front view of all of the push-button MTB panels.

Figure 9A.16
Push-Button MTB panel



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Only the three push-button MTB panels are covered in these sections. The system installer may develop custom MTB panels for specific applications. Refer to the system installer's literature for any information on custom MTB panels.

If a custom MTB panel is to be used, the MTB I/O module can be purchased separately to interface a custom MTB panel with the system I/O ring. To use a custom panel with the I/O module, you must set JPR3 to the Custom Panel position.

9A.4.1 MTB Panel Connectors and Pin Assignments (fiber-optic versions)

Figure 9A.17 shows the terminal blocks and connectors used to connect both versions Fiber–Optic push-button MTB panels (incandescent and LED lamps).

The MTB panel I/O module is interfaced with the system I/O ring using fiber optic cables that are connected to the optical receiver and transmitter on the I/O module. Refer to page 7B-1 for additional information on fiber optic cables and connectors.

The MTB I/O module interfaces the push-button MTB panel with the control. It provides 44 inputs and 18 outputs to the system I/O ring. These inputs and outputs provide communication between the push-button MTB panel and the control.

Figure 9A.17
Push-Button MTB Panel Terminal Block and Connectors

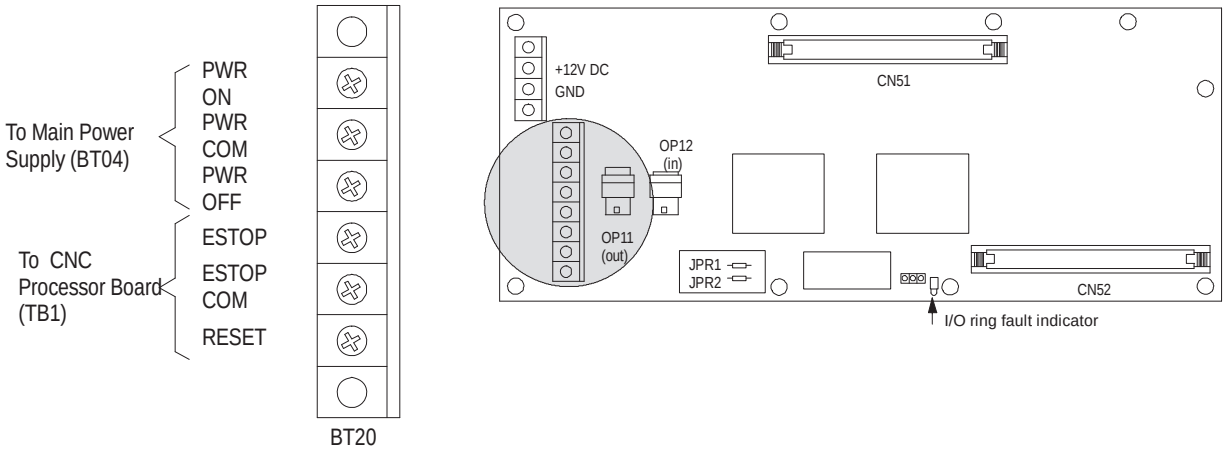


Table 9A.J shows the terminal connector used to connect the push-button MTB panel to the power supply and the CNC processsor.

Table 9A.J
Push-Button MTB Panel Terminal Connector BT-20

Connector On Push-Button MTB Panel		Connected To Component	Connector		Cable Number
BT-20	PWR ON	Power Supply	BT04	ON	C01
	PWR COM			SW	
	PWR OFF			COM	
	E-STOP	Motherboard/System Processor	BT01	E-STOP	C06
	E-STOP COM			COM	
	RESET			RESET	

Table 9A.K shows additional connectors of the push-button MTB panel.

Table 9A.K
Push-Button MTB Panel Connectors

Connector On Push-Button MTB Panel	Connected To Component	Connector		Cable Number	Remark
+12V	Operator Panel		+12V		
GND	Power Supply	BT03	GND	C28	
Input Interface Ribbon Cable	Standard MTB	CN51		C26	Input
Output Interface Ribbon Cable	Panel I/O Module	CN52		C27	Output
CN56F	Motherboard/System Processor	CN16F		C07	Port B

Input Interface Ribbon Cable

Input signals from the push-button MTB panel are sent through input interface ribbon cable to connector CN51 on the push-button MTB panel I/O module. These signals are then sent to the motherboard via the fiber optic I/O ring. Table 9A.L shows the pin assignments and functions for input interface ribbon cable on the push-button MTB panel.

PAL expects the push-button MTB panel input signals, which are shown below, to be sent through the push-button MTB panel I/O module on the corresponding pin numbers. If the input signals differ from those listed in Table 9A.L, the PAL I/O assignments file must be altered. Refer to the 9/Series CNC 9/230,9/260, and 9/290 PAL Reference Manual, publication 8520-4.3, for more information.

The default settings at power-up for the push-button MTB panel are:

Selection	Default
Mode Select	MAN
Jog Select	CONT
Speed/Multiply	X1
Spindle	OFF
Rapid Feedrate Override	F1

Output Interface Ribbon Cable

Output signals from connector CN52 on the push-button MTB panel I/O module are sent to the push-button MTB panel via the output interface ribbon cable. Table 9A.M shows the pin assignments and functions for output interface ribbon cable on the push-button MTB panel. PAL outputs signals to the push-button MTB panel through the push-button MTB panel I/O module on the corresponding pin numbers. If the output signals differ from those listed in Table 9A.M, the PAL I/O assignments file must be altered. Refer to the 9/Series CNC 9/230, 9/260, and 9/290 PAL Reference Manual, publication 8520-4.3, for more information.

Table 9A.L
Push-Button MTB Panel Input Interface Ribbon Cable Pin Assignments

Pin No.	Function	Gray Code	PAL Device Name	Pin No.	Function	Gray Code	PAL Device Name
1	Cycle Stop	N/A	CN51-1	2	+12V	N/A	N/A
3	Cycle Start		CN51-3	4	+12V		
5	Single Block		CN51-5	6	+12V		
7	+X		CN51-7	8	+12V		
9	+Y		CN51-9	10	+12V		
11	+Z		CN51-11	12	+12V		
13	+4		CN51-13	14	AUTO	a	CN51-34
15	-X		CN51-15	16	MDI	b	CN51-32
17	-Y		CN51-17	18	MANUAL		
19	-Z		CN51-19	20	INCR	a	CN51-30
21	-4		CN51-21	22	CONT	b	CN51-28
23	TRVRS		CN51-23	24	HAND		
25	F5		CN51-25	26	HOME		
27	F6		CN51-27	28	X1	a	CN51-40
29	F 1		CN51-29	30	X10	b	CN51-38
31	F 2		CN51-31	32	X100	c	CN51-36
33	F 3		CN51-33	34	X1000		
35	F 4		CN51-35	36	X10000		
37	Feedrate Override “a”	a	CN51-37	38	Rapid Override F1	a	CN51-45
39	Feedrate Override “b”	b	CN51-39	40	Rapid Override 25	b	CN51-47
41	Feedrate Override “c”	c	CN51-41	42	Spindle Speed Override “d”	d	CN51-42
43	Feedrate Override “d”	d	CN51-43	44	Spindle Speed Override “c”	c	CN51-44
45	Not Used	N/A	N/A	46	Spindle Speed Override “b”	b	CN51-46
47				48	Spindle Speed Override “a”	a	CN51-48
49				50	Rapid Override 50		
51	Power Off			52	Rapid Override 100		
53	Power Common			54	CCW	a	CN51-49
55	Power On			56	OFF	b	CN51-50
57	E-stop			58	CW		
59	E-stop Common			60	Reset		N/A

Table 9A.M
Push-Button MTB Panel Output Interface Ribbon Cable Pin Assignments

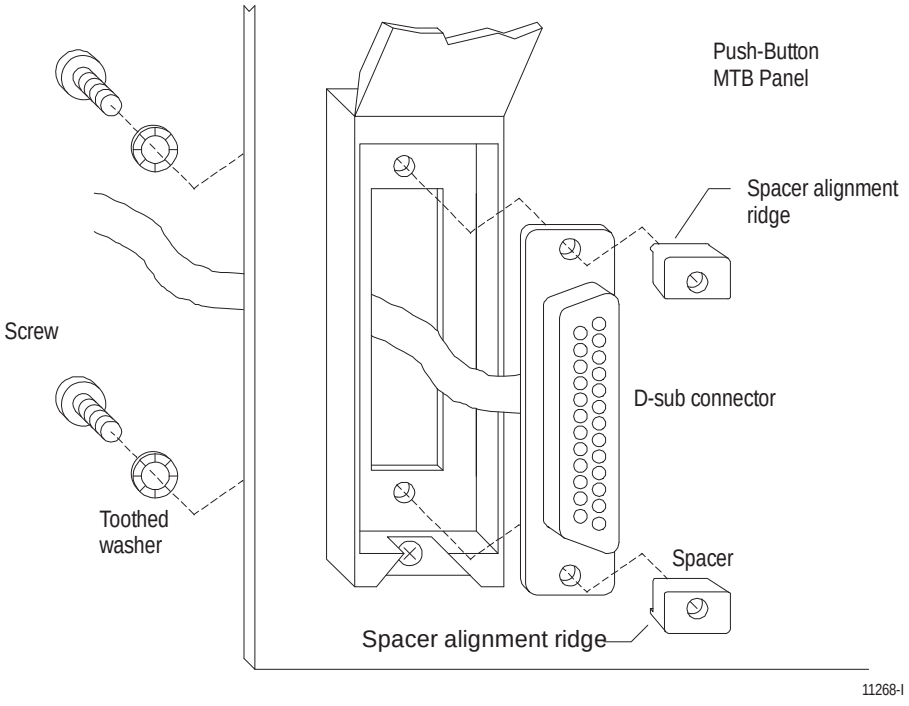
Pin No.	Function	PAL Device Name	Pin No.	Function	PAL Device Name
1	Cycle Stop	CN52-1	2	Ground	N/A
3	Cycle Start	CN52-3	4		
5	Single Block	CN52-5	6		
7	+X	CN52-7	8		
9	+Y	CN52-9	10		
11	+Z	CN52-11	12		
13	+4	CN52-13	14		
15	-X	CN52-15	16		
17	-Y	CN52-17	18	F 4	CN52-18
19	-Z	CN52-19	20	F 3	CN52-20
21	-4	CN52-21	22	F 2	CN52-22
23	Trvrs	CN52-23	24	F 1	CN52-24
25	Jog Retract	CN52-25	26	F6	CN52-26
27	Ground	N/A	28	AUTO	N/A
29			30	MDI	
31			32	MANUAL	
33			34	Rapid Override F1	
35			36	Rapid Override 25	
37			38	Rapid Override 50	
39	Not Used		40	Rapid Override 100	
41	X1		42	CCW	
43	X10		44	OFF	
45	X100		46	CW	
47	X1000		48	INCR	
49	X10000		50	CONT	
51	Ground		52	HAND	
53			54	HOME	
55			56	Ground	
57			58		
59			60		

Serial Interface Connector CN56F

The push-button MTB panel has an optional serial interface connector (CN56F). This connector provides an external interface port for a peripheral's RS 232 or RS 422 interface cable. It is interfaced with Port B (connector J7) on the motherboard/system processor boards by cable C07. Refer to page 7A-22 for additional information on cable C07.

Connector CN56F (8520-D25FS) is a 25 pin D-shell connector that is connected to one end of cable C07. This connector is then mounted on the left side of push-button MTB panel under the connector cover. Figure 9A.18 shows the location and mounting instructions for connector CN56F.

Figure 9A.18
Push-Button MTB Panel Optional Connector CN56F



Important: The two screws with their corresponding spacers and the serial port cover are included with the push-button MTB panel.

9A.4.1.1 MTB I/O Module Specifications

Power Supply Specifications

Table 9A.N lists the power requirements for the MTB I/O module.

Table 9A.N
MTB I/O Module Power Requirements

Item	Specifications
Rated Input Voltage	12V dc
Power Source Voltage Range	11.5-13.2V dc
Power Consumption	1.3 A typical, 2.6 A maximum

Input Specifications

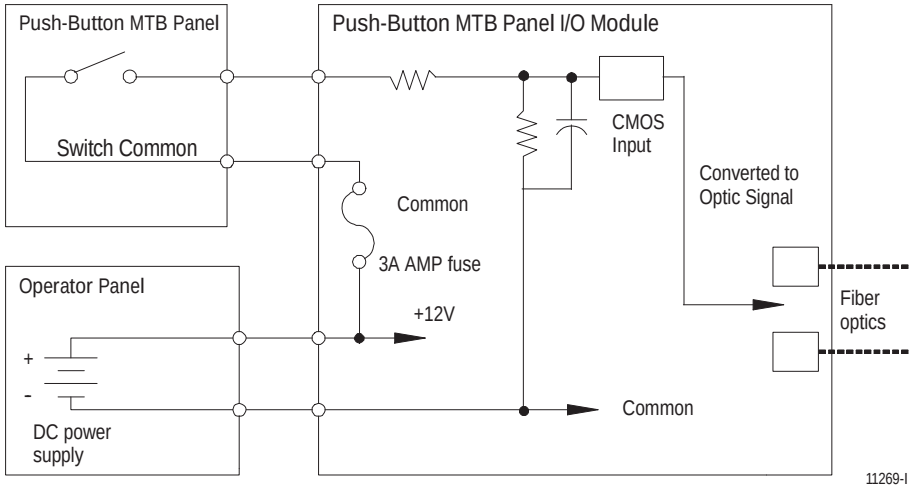
Table 9A.O lists the input specifications for the circuit that receives the signals from the pushbuttons and the selector switches on the push-button MTB panel.

Table 9A.O
MTB I/O Module Input Specifications

Item	Specifications		Remark
	A-B MTB Panel	Custom MTB Panel	
Number of Input Points	54	44	Total input signals from all switch groups
Modal Group	19		
Discrete I/O	18		
Rotary Input	8		
Interconnect Group	6		
Unused	3		
	All MTB Panels		
Operating Voltage ON	11.5 to 13.2 V dc		
OFF	0-2V dc		
Allowable Voltage Drop	Less than .5V dc		For External Device
Input Impedance	2.25 K ohms		
Input Current at ON	5mA		With 12V dc Input
Leakage Current at OFF	Less than 1mA		
Response	1-22 msec. Includes Digital Filter Time		OFF • ON, ON • OFF
Number of Common Points	6 (per 44 inputs)		Internally connected to Power Supply
Fuse	3A		Protects 12V Power Supply
Isolation	Non-Isolated type		
Connection	60 Pin flat cable connector (CN51)		Max. Length 1m

Figure 9A.19 shows the input circuit diagram for the MTB I/O module.

Figure 9A.19
MTB I/O Module Input Circuit Diagram



Output Specifications

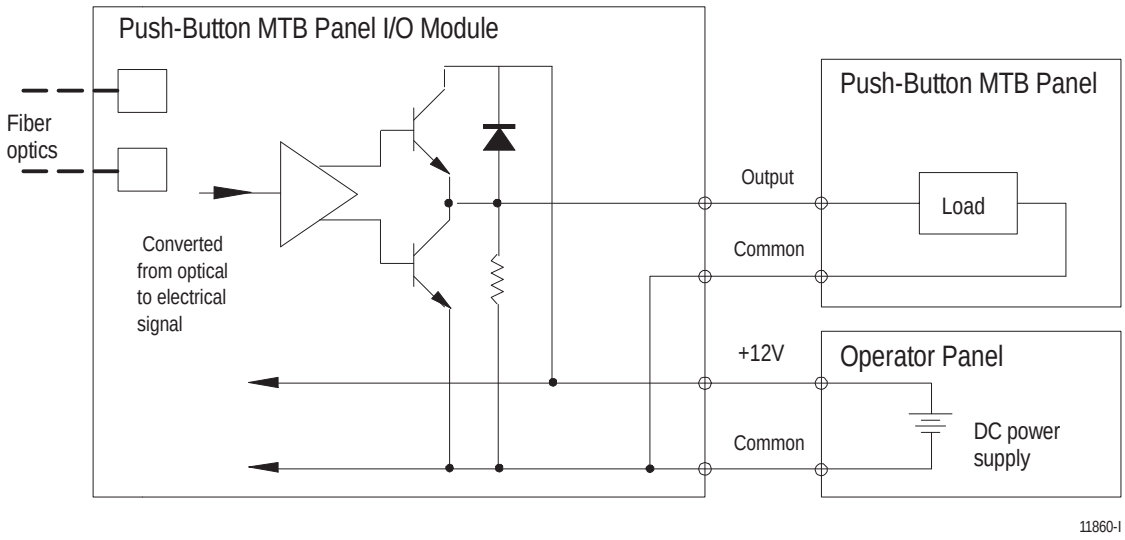
Table 9A.P lists the output specifications for the circuit that outputs the operation status to the push-button MTB panel.

Table 9A.P
MTB I/O Module Output Specifications

Item	Specifications		Remark
	A-B MTB Panel	Custom MTB Panel	
Number of Output Points	37	18	
Modal Group Outputs	19		Non-I/O Outputs
Discrete Outputs	18		I/O Outputs
Output Type	Sink/Source		Totem Pole Driver Output
Output Voltage Range	9.3-13.2V dc		
Output Current at ON	Less than 125mA		Per Each Output
Output Voltage Drop at ON	Less than 1 V DC		
Number of Common Points	22		Internally Connected to Power Supply
Isolation	Non-Isolated type		
Connection	60 Pin Flat Cable Connector (CN52)		Max. Length 1m

Figure 9A.20 shows the output circuit diagram for the MTB I/O module.

Figure 9A.20
MTB I/O Module Output Circuit Diagram



9A.4.1.2 MTB Panel I/O Module Fiber Optic Connection

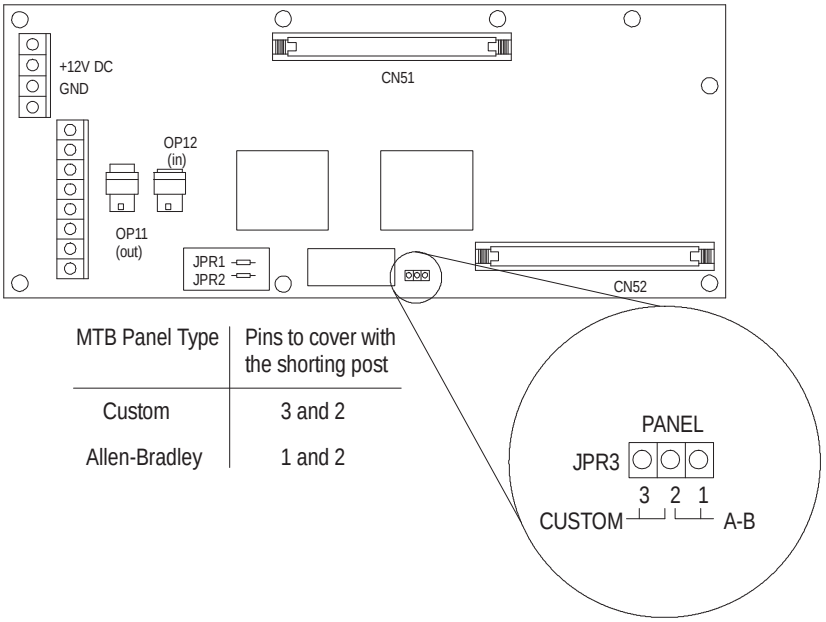
Table 9A.Q shows the connectors used to make the fiber optic connections to the I/O ring. Each module connected to the system I/O ring has an optical transmitter and receiver. Fiber optic cables connect transmitters to receivers to form the I/O ring.

Table 9A.Q
MTB I/O Module Fiber Optic Connectors

Connector On Motherboard	Connected To	Remark
OP11 (RED)	Receiver on next module in I/O ring	Output
OP12 (BLACK)	Transmitter on previous module in I/O ring	Input

9A.4.1.3 MTB I/O Module Mode Setting

If you are using a custom MTB panel you need to set a jumper so that the I/O module can interface with the MTB panel. If you have an Allen-Bradley MTB panel, you don't need to set this jumper because it is preset. Set the jumper as shown:

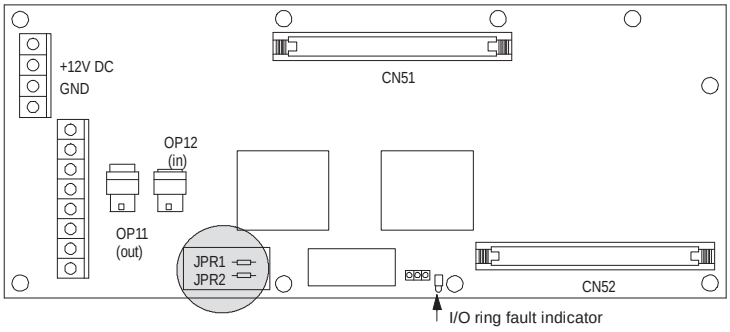


MTB Panel Type	Pins to cover with the shorting post
Custom	3 and 2
Allen-Bradley	1 and 2

9A.4.1.4 MTB I/O Module Node Address Setting

Each push-button MTB panel must have a unique node address on the I/O ring. The node address corresponds to a unique address assigned to each push-button MTB panel I/O module in the I/O assignment file. The node address is selected by cutting the jumpers located on the push-button MTB panel I/O module. Figure 9A.21 shows the location of the jumpers.

Figure 9A.21
MTB I/O Module Jumper Positions



Set the node address by cutting the wire jumper(s) on the push-button MTB panel I/O module, according to Table 9A.R shown below.

Table 9A.R
MTB I/O Module Node Address Setting

Node Address		Jumper	
Hexidecimal	Binary	JP1	JP2
00	00	Short	Short
01	01	Short	Open
02	10	Open	Short
03	11	Open	Open

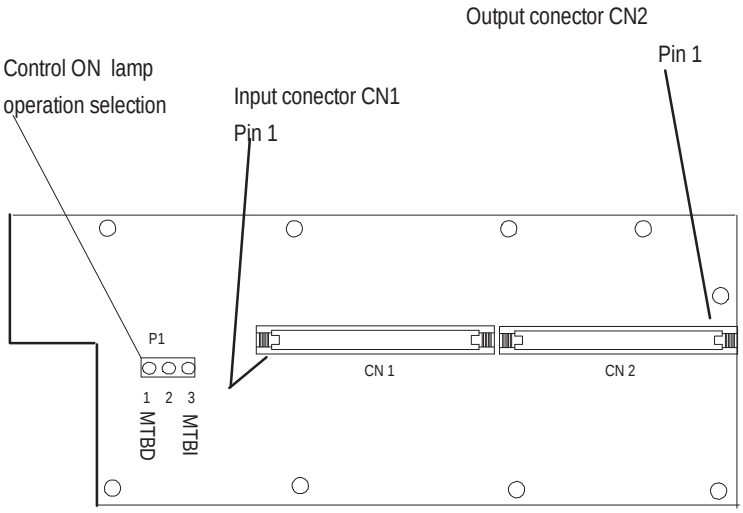
The node address may be any number between 00 and 03. You may have a total of 4 MTB panels on the Fiber Optic I/O ring. The same node address can be used for different types of modules, but may not be used more than once for a specific type of module.

9A.4.2 MTB Panel Connectors and Pin Assignments (Direct I/O version)

Figure 9A.22 shows the connectors used to connect the Direct I/O push-button MTB panel to your I/O system.

The Direct I/O version of the MTB Panel provides for 51 inputs to and 38 outputs from the I/O system. These inputs and outputs provide machine control functions for the operator to affect the Machine logic (PAL) program. A separate I/O ring device must be used to interface this panel to the 9/Series control.

Figure 9A.22
Direct I/O MTB Panel Connectors



Direct I/O MTB panel integration

1) Note the locations of pin number one (#1) of CN1 and CN2 . Although the pin #1 locations are the same with respect to the connector keying, the connectors are oriented differently.

2) The P1 jumper is used to set the operation of the "control on" Lamp. In the 1–2 position (MTBD) the lamp is controlled by the I/O system (on when 24V is applied to pin CN2–32). In the 2–3 position (MTBI) the lamp is on whenever 24V is applied to the panel.

Input Interface Connector

Input signals from the direct I/O MTB panel are sent through input connector CN 1 . These signals are available for use by the I/O system by pins supplied with this panel. Table 9A.S shows the pin assignments and functions for input interface ribbon cable on the push-button MTB panel.

Table 9A.S
Direct I/O MTB Panel Input connector (CN 1) Pin Assignments

Pin No.	Function	Pin No.	Function
1	+24 V	2	Cycle Stop
3	+24 V	4	Cycle Start
5	+24 V	6	Single Block
7	+24 V	8	+X
9	+24 V	10	+Y
11	+24 V	12	+Z
13	AUTO	14	+4
15	MDI	16	-X
17	MANUAL	18	-Y
19	INCR	20	-Z
21	CONT	22	-4
23	HAND	24	TRVRS
25	HOME	26	F5
27	X1	28	F6
29	X10	30	F 1
31	X100	32	F 2
33	X1000	34	F 3
35	X10000	36	F 4
37	Rapid Override F1	38	Feedrate Override "a"
39	Rapid Override 25	40	Feedrate Override "b"
41	Spindle Speed Override "d"	42	Feedrate Override "c"
43	Spindle Speed Override "c"	44	Feedrate Override "d"
45	Spindle Speed Override "b"	46	Not Used
47	Spindle Speed Override "a"	48	Not Used
49	Rapid Override 50	50	Not Used
51	Rapid Override 100	52	Power Off
53	CCW	54	On / Off Pushbutton Common
55	OFF	56	Power On
57	CW	58	E-stop
59	Reset	60	E-stop PB Common

Output Interface connector

Output signals from the I/O system are sent to the Lamps on the Direct MTB panel via the output interface connector CN 2. Table 9A.T shows the pin assignments and functions for this connector.

Table 9A.T
Direct I/O MTB Panel Output connector (CN 2) Pin Assignments

Pin No.	Function	Pin No.	Function
1	Ground	2	Cycle Stop
3	Gnd	4	Cycle Start
5	Gnd	6	Single Block
7	Gnd	8	+ X
9	Gnd	10	+ Y
11	Gnd	12	+ Z
13	Gnd	14	+ 4
15	Gnd	16	- X
17	F 4	18	- Y
19	F 3	20	- Z
21	F 2	22	- 4
23	F 1	24	Trvrs
25	F 6	26	F5
27	AUTO	28	Not Used
29	MDI	30	Not Used
31	MANUAL	32	MANUAL
33	Rapid override F1	34	Contro On (if P1 is set to 1-2)
35	Rapid Override 25	36	Not Used
37	Rapid Override 50	38	Not Used
39	Rapid Override 100	40	Not Used
41	CCW	42	X 1
43	OFF	44	X 10
45	CW	46	X 100
47	INCR	48	X 1000
49	CONT	50	X 10 000
51	HAND	52	GND
53	HOME	54	GND
55	GND	56	GND
57	GND	58	GND
59	GND	60	GND

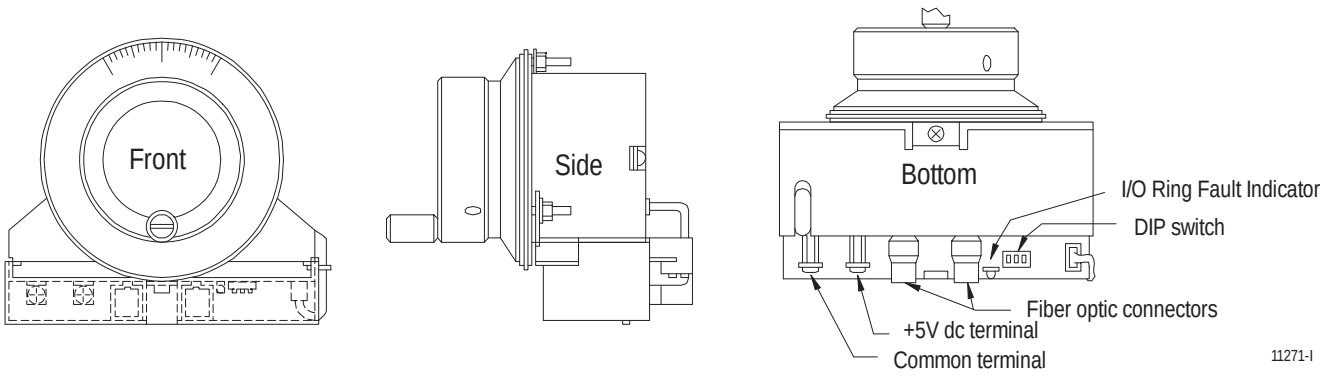
9A.5 HPG (Hand Pulse Generator)

The Hand Pulse Generator (HPG) is a hand wheel used for manual operation of the the control's axes. The HPGs are generally used to jog axes into position. The operator panel power supply provides power for three Hand Pulse Generators.

The HPG is composed of two parts, the HPG itself and the HPG interface board. The HPG interface board is used to interface the HPG with the fiber optic I/O ring. Fiber optic cables are connected to the optical receiver (black) and transmitter (red) on the HPG interface board. The fiber optic cables and connectors are supplied by the system installer. For more information on fiber optics refer to page 7B-1.

Figure 9A.23 shows the HPG (Hand Pulse Generator).

Figure 9A.23
HPG (Hand Pulse Generator)



9A.5.1 HPG Connectors

Figure 9A.24 shows the connectors and terminal block used to make connections to the HPG interface board.

Figure 9A.24
HPG Interface Board Connectors and Terminal Block

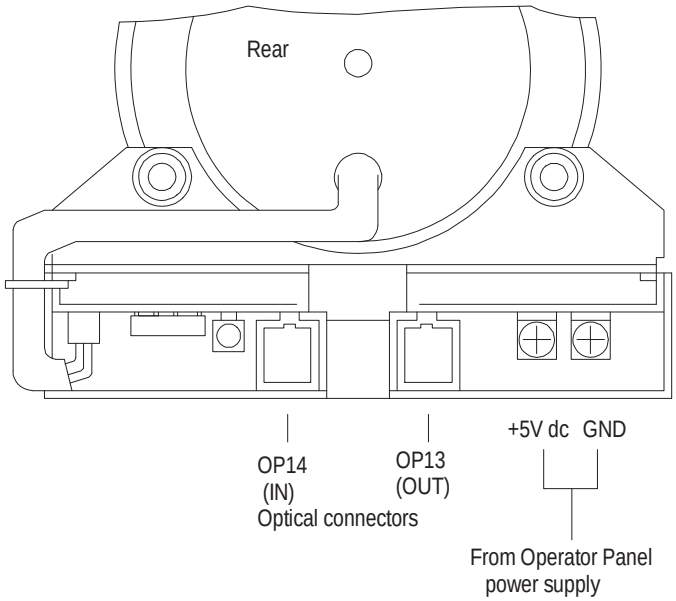


Table 9A.U shows the power supply connections to the HPG interface board.

Table 9A.U
HPG Power Supply Connectors

HPG Connector Terminal		Connected To	Mating Connector		Cable Number	Remark
BT23	+5V	Operator Panel	BT03	5V dc	C28	Input
	GND	Power Supply		GND		Output

Table 9A.V shows the connectors used to make the fiber optic connections to the I/O ring. Each module connected to the system I/O ring has an optical transmitter and receiver. Fiber optic cables connect transmitters to receivers to form the I/O ring. Refer to page 7B-1 for additional information on fiber optic cables and connectors.

Table 9A.V
HPG Fiber Optic Connectors

Connector On Motherboard	Connected To	Remark
OP13 (RED)	Receiver on next module in I/O ring	Output
OP14 (BLACK)	Transmitter on previous module in I/O ring	Input

9A.5.2 HPG Power Requirements

The HPGs require a +5V dc power supply. This is supplied from connector BT03 on the operator panel power supply. If the control uses more than three HPGs the system installer will have to provide an external power supply. Table 9A.W lists the power requirements for the HPG.

Table 9A.W
HPG Power Requirements

Item	Specifications
Rated Input Voltage	5V dc
Power Source Voltage Range	4.75-5.25V dc
Power Consumption	Less than 0.4A
Connection	2-M3 Terminals
Distance from Power Supply	Less than 5 meters

9A.5.3 HPG Node Address Setting

Each HPG must have a unique node address on the I/O ring. The node address corresponds to a unique address assigned to each HPG in the I/O assignment file. Select the node address using the switch assembly shown in Figure 9A.25. Table 9A.X lists the required switch assembly settings for each possible node address.

Figure 9A.25
HPG Interface Board Switch Assembly Location

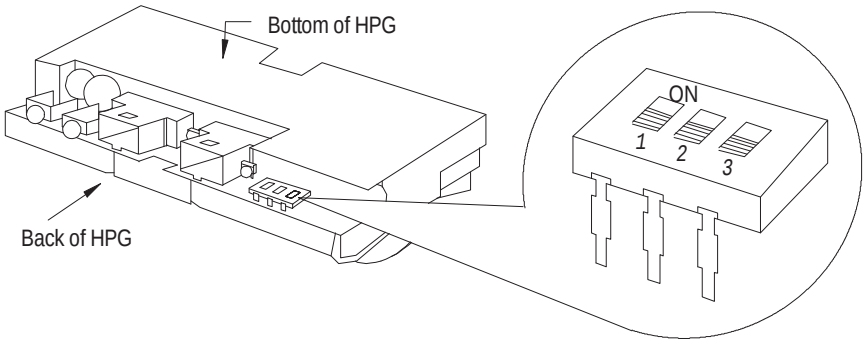


Table 9A.X
HPG Node Address Settings

Node Address		Switch Assembly Position		
Hexadecimal	Binary	1	2	3
00	000	OFF	OFF	OFF
01	001	OFF	OFF	ON
02	010	OFF	ON	OFF
03	011	OFF	ON	ON
04	100	ON	OFF	OFF
05	101	ON	OFF	ON
06	110	ON	ON	OFF
07	111	ON	ON	ON

The node address may be any number between 00 and N, with N being the total number of modules allowed for a specific type of module. The same node address may be used for different types of modules, but may not be used more than once for a specific type of module.

END OF SECTION

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